Union Chemical
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35238

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Union Chemical Company, Inc.
South Hope, Maine

STATEMENT OF PURPOSE

This decision document presents the selected remedial action for the Union Chemical Company, Inc. site (the "Site"), located in South Hope, Maine. This document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (NCP); 40 CFR Part 300 et seq. (1990). The Regional Administrator for Region I of the United States Environmental Protection Agency (EPA) has been delegated the authority to approve this Record of Decision.

The State of Maine has concurred on the selected remedy and determined, through a detailed evaluation, that the selected remedy is consistent with Maine laws and regulations.

STATEMENT OF BASIS

This decision is based on the Administrative Record compiled for the Site which was developed in accordance with Section 113(k) of CERCLA. The Administrative Record is available for public review at the Hope Town Hall in Hope, Maine, and at the EPA Region I Waste Management Division Records Center in Boston, Massachusetts. The Administrative Record index (attached as Appendix C to the ROD) identifies each of the items which comprise the Administrative Record upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedial action for the Union Chemical Company, Inc. site is a comprehensive, multi-component approach for overall remediation of the contaminated on-site soils, groundwater, and facilities, and a further evaluation of off-site soils surrounding the Site. The selected remedy addresses the significant threats to human health and the environment posed by the Site. Furthermore, the principal threat to human health and the environment posed by the Site -- the highly contaminated groundwater found on the Site -- is addressed through treatment, to the maximum extent practicable, of the source of this contamination and of the contaminated groundwater itself.

The remedy selected in the ROD incorporates the following components:

- Soil Excavation and On-Site Low-Temperature Soil Aeration Treatment;
- Vacuum-Enhanced Groundwater Extraction, On-Site Groundwater Treatment, and On-Site Discharge of Treated Groundwater into Quiggle Brook;
- Facilities Decontamination and Demolition, and Off-Site Disposal of Debris; and
- Limited Action for Off-Site Soils;

These four components are summarized below:

<u>Soil Excavation and On-Site Low-Temperature Soil Aeration Treatment</u>

Once the existing facilities have been removed from the Site, contaminated soils within the unsaturated zone exceeding soil cleanup levels will be excavated. Contaminated soils will also be excavated from the saturated zone between the old leach field and interceptor trench which exceed soil clean-up levels. After a screening process has been performed to remove cobbles and/or boulders (which will be crushed prior to treatment), excavated soils will be treated on-site using a low-temperature soil aeration or equivalent thermal desorption treatment process. Potential airborne releases of volatile organic and particulate emissions during excavation and treatment will be minimized by the use of several air pollution control techniques. The organic contaminants that are volatilized from the contaminated soils as vapors from the treatment process will be further collected (for eventual treatment off-site) using vapor-phase carbon adsorption materials or an equivalent method. Fugitive dust from the treatment process will be collected by air pollution control equipment. Frequent and representative sampling of soil from excavated areas and treated soil, as well as continuous air monitoring, will take place during the entire excavation/treatment process. Treated soils will be backfilled on the Site, and the Site will be regraded and revegetated.

Prior to full-scale treatment of the contaminated soils, pilot-scale tests will be conducted using site-specific soils. The primary objectives of these tests will be to confirm that the site-specific soil cleanup levels and treatment standards will be met and to provide additional design data for the soil treatment system including the air pollution controls required.

Vacuum-Enhanced Groundwater Extraction, On-Site Groundwater Treatment, and On-Site Discharge of Treated Groundwater into Quiggle Brook

On-site contaminated groundwater will be extracted and treated using ultraviolet (UV)/oxidation or an equivalent destruction technology. The need for pre- or post-treatment of the groundwater will be further evaluated during design-phase treatability studies, and will be implemented as required. The treated groundwater will be discharged to Quiggle Brook via a pipe. The vacuum-extracted contaminated soil gasses will be collected (for eventual treatment off-site) using a vapor phase carbon adsorption process or equivalent treatment technology prior to discharge to the atmosphere. Institutional controls will be required both on- and off-site during the remedial action to reduce the potential for exposures by humans to the contaminants on the Site, and the potential further migration of contaminants off the Site.

Pilot-scale treatability studies, additional aquifer tests, and a fate and transport model will be conducted to provide additional design data for the groundwater treatment system. Several vacuum-enhanced extraction wells will be installed on the site to extract contaminated groundwater from the till and weathered bedrock. The extraction well configuration will be refined, as necessary, during the course of the remedial action.

Facilities Decontamination and Demolition, and Off-Site Disposal of Debris

Facilities currently on the Site will be decontaminated by high-pressure steam cleaning or another effective decontamination technique. Water remaining in sumps on the Site and from decontamination activities will be collected and treated in the groundwater treatment system, if technically practicable.

Concrete structures will be crushed and treated in the on-site soil treatment facility. The asbestos in the still building will be appropriately containerized and removed for off-site disposal. Any other RCRA hazardous waste associated with the existing facilities (including the dioxin-containing ash in the secondary scrubber equipment of the incinerator) will be treated by best available and appropriate techniques prior to off-site disposal. Following decontamination procedures, existing facilities will be demolished, sampled, and the debris disposed of off-site in an appropriate facility. Various techniques will be used to mitigate the release of airborne emissions during all decontamination and demolition activities.

Limited Action for Off-Site Soils

Further monitoring and analysis of off-site soils will be conducted to define whether or not off-site soil contamination is present as a result of past Union Chemical Company, Inc. operations and, if so, whether this contamination warrants further remedial action. Following one year of continuous, site-specific collection of meteorological data, additional air modeling simulations will be performed to determine the potential off-site locations where airborne materials from the Site may have been deposited. Subsequent to a review of this data from air modeling simulations (or sooner, if required), as well as a review of existing data, soil samples will be collected and analyzed from selected locations. After five years of meteorological data collection from the Site, additional air modeling simulations will be performed and the need for additional soil sampling evaluated. Throughout all phases of this data collection and analysis effort, EPA will determine if additional remedial actions are required for off-site soils.

FIVE-YEAR REVIEW

As required by law, EPA will review the Site at least once every five years after the initiation of remedial action if any hazardous substances, pollutants or contaminants remain at the Site to assure that the remedial action continues to protect human health and the environment. EPA will also evaluate the risks posed by the Site at the completion of the remedial action (i.e., before the Site is proposed for deletion from the NPL).

DECLARATION

The selected remedy for the Union Chemical Co., Inc. Site is protective of human health and the environment, attains all Federal and State requirements that are applicable or relevant and appropriate (ARAR) to this remedial action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Dec. 27, 1990
Date

Julie Belaga
Julie Belaga
Regional Administrator
U.S. EPA, Region I

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I

RECORD OF DECISION

UNION CHEMICAL CO., INC. SUPERFUND SITE
SOUTH HOPE, MAINE

DECEMBER 27, 1990

UNION CHEMICAL CO., INC. SUPERFUND SITE
RECORD OF DECISION

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I. SITE NAME, LOCATION AND DESCRIPTION

The Union Chemical Company, Inc. site (the "Site") is located within the Town of Hope, Maine (see attached Figure 1), which is approximately seven miles west of Rockland and Camden, Maine. The Union Chemical Company, Inc. ("UCC") Site occupies approximately 12.5 acres along the south side of Route 17, in the village of South Hope, Knox County, Maine (see attached Figure 2). A majority of UCC's past Site activities took place within a 2.25-acre fenced area. This fenced-in area currently encloses most of the plant's former waste handling facilities, including the Still Building, the former Warehouse concrete pad, the old Leach Field, and the incinerator and associated equipment (see attached Figure 3). Apart from the 2.25-acre fenced in area, the UCC Site is readily accessible.

The Site is adjacent to numerous residential dwellings, some of which are within 150 feet of the Site along the north side of Route 17 and 400 feet west of the Site along the south side of Route 17. The Site is bounded on the east and southeast by Quiggle Brook, which is a southerly flowing outlet stream of Fish Pond. Quiggle Brook flows southward for approximately 5 miles before discharging into Crawford Pond, a drinking water source. Fish Pond is located approximately 300 feet northeast of the Site, along the north side of Route 17. A floodplain and wetland area exist along Quiggle Brook at the eastern edge of the Site, and intermittent wet areas in the northwest corner and immediately south of the fenced-in portion of the Site have been identified as wetlands.

A more complete description of the Site can be found in Section 2.0, at pages 8 through 14, of the Final Draft Remedial Investigation (RI) report.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land Use and Response History

The Union Chemical Company was incorporated as a paint stripping and solvent manufacturing business, and began operations in South Hope, Maine in 1967. Prior to commencing these operations, the property along Route 17 was wooded, rural land that was the site of a small meeting house or church, which was surrounded by the many residential dwellings which are in existence today.

Initially, plant operations consisted of formulating patented solvents for stripping paint and coatings from furniture and other items. These chemical products were originally manufactured and utilized on the premises for stripping furniture, and later for distribution throughout the United States and Canada.

The company eventually expanded operations to include recycling of used stripping compounds and solvents from other businesses. Recycling initially occurred using a small solvent recovery or distillation unit, but was later expanded to include the use of the on-site boiler for the treatment of these compounds. In 1982, operations were further expanded to include a full-scale, fluidized-bed incinerator which acquired interim status under the Resource Conservation and Recovery Act (RCRA) to treat hazardous wastes.

Groundwater contamination on the Site and contamination of Quiggle Brook was first discovered by the State of Maine, Department of Environmental Protection (MDEP) in late 1979. The Union Chemical Company contracted with Wright Pierce Architects/Engineers (Wright-Pierce), on June 4, 1981, to conduct the first organized, technically-oriented evaluation of the hydrogeology of the Site. The primary objective of this study was to gather chemical and hydrogeologic data to support the development of a cleanup plan for the contaminated soils and groundwater discovered along the east side of the Site. The analysis of samples and subsequent evaluation of data collected by Wright-Pierce indicated that two contaminated groundwater plumes were present in the area between the facilities and Quiggle Brook. The Wright-Pierce data further indicated that the more northerly groundwater plume resulted from the migration of chemical constituents from an Old Leach Field on the Site (see attached Figure 3), while the source of the more southerly plume was believed to be a former drum storage area south of the plant buildings, where a storage tank had reportedly leaked.

In November 1981, Wright-Pierce was again commissioned by the Union Chemical Company to install piezometers (monitoring wells) to observe the groundwater contamination and flow beneath the Site. Two groundwater flow patterns, or aquifer systems, were identified using groundwater elevation measurements from the numerous piezometers installed on the Site. One of these aquifer systems was found to flow in the till underneath the Site (referred to as the shallow aquifer), and a second system was identified in the bedrock (referred to as the bedrock aquifer). Wright-Pierce concluded that the shallow groundwater beneath the Site flows easterly and discharges into Quiggle Brook under both pumping and non-pumping conditions. It was also concluded that Quiggle Brook was a likely discharge point for the majority of the groundwater flowing through the bedrock beneath the Site under non-pumping conditions at the Site.

Between 1979 and 1984, the MDEP cited the plant for deficiencies in and/or violations of several operating licenses. Additionally, the MDEP conducted numerous investigations into potential impacts of chemical contamination at and from the Site. MDEP closed the hazardous waste treatment operations at the Site in June 1984, at which time approximately 2,000 - 2,500 55-gallon drums and 30 liquid storage tanks were found on the Site. All of the materials contained within the 55-gallon drums and all but two of the liquid storage tanks located on the Site in June 1984 were removed by EPA and the MDEP by the end of November 1984.

In 1986, the state court ordered that UCC be evicted from the Site, and appointed Maine DEP as the receiver of the property. All UCC operations ceased at that time. MDEP installed additional groundwater monitoring wells during the winter of 1986. Groundwater samples were taken from these monitoring wells to provide a clearer understanding of the contamination existing at the Site. Groundwater monitoring data from these wells indicated that chemicals had not migrated across Quiggle Brook, confirming the Wright-Pierce conclusion that the brook acts as a divide (barrier) to the flow of till and shallow bedrock groundwater underneath the brook. Further data collected by the MDEP indicated that the contamination found in Quiggle Brook was limited to the marshy (wetland) areas along Quiggle Brook nearest the Site, and a portion of the brook approximately 200 feet in length downstream from these marshy areas. Volatile organic compounds (VOCs), similar to those processed by the UCC on the Site, were the principal contaminants observed in Quiggle Brook.

B. Enforcement History

As noted above, separate and joint response actions by EPA and MDEP were undertaken in late 1984 after hazardous waste treatment operations ceased on the Site in June 1984. These cleanup activities resulted in the removal of the barrels, liquids, and all but two large storage tanks from the Site. Historical environmental sampling has shown that the groundwater, surface water (i.e., Quiggle Brook), and soils on the Site have been contaminated by past UCC operations.

The UCC Site was first proposed in April 1985 for inclusion on EPA's Superfund National Priorities List (NPL), the roster of sites eligible for long-term cleanup funds. The Site was later re-proposed in June 1988 and formally included on the NPL in October 1989.

On March 23, 1987, EPA notified UCC and its president, Raymond Esposito, and approximately 375 additional parties who either generated wastes that were shipped to the Site, arranged for the disposal of wastes at the Site, or transported wastes to the Site of their potential liability with respect to the Site. Negotiations commenced with these potentially responsible parties (PRPs) on May 5, 1987 for recovery of past costs expended by EPA and DEP and for the performance of a Remedial Investigation (RI)/Feasibility Study (FS) at the Site.

The PRPs formed a steering committee during the summer of 1987. This committee was involved in substantial negotiations with the EPA and MDEP throughout the summer and fall of 1987.

Later in the fall of 1987, EPA and MDEP reached agreements in the form of two Administrative Orders by Consent (AOC) which required the PRPs to begin investigations aimed at identifying remedial alternatives for the Site. Approximately two hundred and ninety (290) PRPs were involved in these two administrative orders. The first administrative order became effective in November 1987 and the second order in January 1988. In these two consent orders, the settling parties agreed to reimburse EPA and the State of Maine for a majority of the response costs incurred prior to May 22, 1987 for cleanup activities at the Site, and to finance the performance and oversight of an RI/FS on the Site. The settling parties established a trust fund to pay for these RI/FS activities and selected a group of Trustees from these settling parties to manage the trust fund.

In August 1989, several additional potentially responsible parties (who were sued by EPA in November 1987) signed a Consent Decree by which EPA was reimbursed for all remaining past response costs incurred at the Site through May 22, 1987, plus interest and enforcement costs. At the present time, EPA is continuing litigation actions against the Union Chemical Co., Inc. (now known as the Union Research Co. or Seneca Research, Inc.), UCC's president, Raymond Esposito, and four other PRPs.

Finally, in January 1990, EPA notified approximately 25 additional parties who either generated wastes that were shipped to the Site or arranged for the disposal of wastes at the Site of their potential liability with respect to the UCC Site. Identification of these additional parties was based upon information provided through an extensive auditing effort performed by EPA, and requested through the steering committee, on the volumetric contribution of selected PRPs identified at the Site.

The PRPs have been very active in the remedy selection process for this Site. As previously noted, a group of approximately 265 PRPs formed a Trust to manage and coordinate the conduct of the RI/FS. In addition, technical comments by the PRPs during the public comment period were submitted in writing and are included in the Administrative Record.

A more detailed description of the Site history can be found in Section 2.0, pages 8 through 31, and Appendix A of the Final Draft RI report.

III. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement has been very high. EPA has kept the community and other interested parties apprised of Site activities through numerous informational meetings, fact sheets, press releases, public hearings, and the establishment of a telephone Hot-Line.

Community interests and discussions with EPA and the State of Maine DEP have been primarily through the two citizens' groups that have been established at the UCC Site. These two groups are the Concerned Citizens of Hope and Hope's Committee for a Clean Environment. In March 1990, Hope's Committee for a Clean Environment was awarded the Technical Assistance Grant (TAG) available for the Site and, in turn, contracted with three technical advisors during June-July 1990.

During March 1988, EPA released a community relations plan which outlined a program to address community concerns and keep citizens informed about and involved in all activities during the remedial activities being undertaken at the UCC Site. On May 18, 1988 and May 3, 1989, EPA held public informational meetings at the Hope Elementary School in Hope, Maine to describe plans for the Remedial Investigation and Feasibility Study.

On May 2 and July 12, 1990, EPA made the administrative record and an addendum to the administrative record available for public review at EPA's offices in Boston and at the Hope Town Hall in Hope, Maine. EPA published a notice and brief analysis of the Proposed Plan in two local newspapers, the Courier Gazette and the Camden Herald, on July 5, 1990. The Proposed Plan was also made available to the public through mailings to approximately 850 interested parties and by inclusion of the Proposed Plan in the administrative record located in Boston and at the Hope Town Hall.

Also on May 2, 1990, EPA held an informational public meeting to discuss the results of the Draft Remedial Investigation/Baseline Risk Assessment report. On July 12, 1990, EPA held another informational public meeting to discuss the results of the Final Draft Remedial Investigation and Baseline Risk Assessment, to discuss the cleanup alternatives presented in the Final Draft Feasibility Study, and to present the Agency's Proposed Plan. During this meeting, the Agency also answered questions from the public.

From July 13, 1990 to October 5, 1990, the Agency held a lengthy, 85-day public comment period to accept public comments on the remedial alternatives presented in the Final Draft Feasibility Study and the

Proposed Plan, and on any other documents previously released to the public as contained in the Administrative Record. On August 1, August 23, and September 17, 1990, the Agency held public hearings to discuss the Proposed Plan and to accept any oral comments. A transcript of these hearings, and the Agency's response to comments made during the public comment period are included in the Responsiveness Summary that is attached as Appendix A hereto.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The selected remedy was developed by combining different source control, management of migration, facilities and off-site soils remedial alternatives to obtain a comprehensive approach for overall Site remediation. In summary, the selected remedy, which includes: (1) extraction and treatment of contaminated groundwater; (2) excavation and treatment of contaminated soils; (3) decontamination (with prior treatment, as appropriate) and demolition of the facilities; and (4) further monitoring and analysis of off-site soils, addresses the significant threats to human health and the environment posed by the Site. Furthermore, the principal threat to human health and the environment posed by the Site -- the highly contaminated groundwater found on the Site -- is addressed through treatment, to the maximum extent practicable, of the source of this contamination and of the contaminated groundwater itself.

V. SUMMARY OF SITE CHARACTERISTICS

Section 1.0 of the Final Draft Feasibility Study (FS) contains an overview of the Remedial Investigation (RI) performed at the Site. The significant findings of the RI are summarized below.

A. Soil (on-site and off-site)

The investigations performed during the RI of on-site soil contamination and potential off-site soil contamination, consisted mainly of:

1) Drilling and sampling 25 soil borings through the concrete pads or containments located on the Site to determine the extent to which chemicals had contaminated the concrete and underlying soils (see attached Figure 4).

2) Drilling and sampling approximately 80 additional soil borings on the Site (to depths ranging from 10 to 15 feet below the ground surface) to determine the extent of chemical contamination in these soils (see attached Figure 4).

3) Drilling and sampling approximately 20 additional soil borings on and in areas surrounding the Site during the installation of additional monitoring wells and piezometers.

4) Sampling off-site surface and subsurface soils at various locations, including selected wooded and residential areas surrounding the Site, to identify potential airborne contamination which may have occurred as a result of UCC's past operation of the Site's hazardous waste incinerator (see attached Figure 5).

These various soil investigations indicated that the stratigraphy of the Site consists of two geologic sequences (see attached Figure 6). The first sequence consists of unconsolidated drift, also referred to as ground moraine deposits, which mainly consists of glacial till. These glacial deposits are predominantly composed of a dense, gray, silty till of Wisconsonian Age. However, some sandy till occurs discontinuously within the silty till at the ground surface east of the facilities and adjacent to Quiggle Brook. These unconsolidated soils extend from the ground surface (with thicknesses varying from 70 feet near Quiggle Brook to less than 25 feet at the western portion of the Site) to the underlying geologic sequence which consists of lower Paleozoic rusty schist and gneiss bedrock with small granitic intrusions. The bedrock is severely weathered and fractured within the upper five feet , immediately below the bedrock/till interface.

Generally, on-site soils affected by the organic chemical contaminants handled on the UCC Site can be grouped into two (2) categories:

1) unsaturated soils (soils located above the groundwater table) that were directly contaminated by the disposal or spilling of contaminants on the ground surface; and

2) saturated soils (soils located below the groundwater table) that were contaminated by the chemicals in the groundwater moving through these soils.

The chemical contamination of the unsaturated soils appears to have occurred as a result of spills or leaks from drums, tanks, or pipes previously located on the Site. The chemical contamination of these unsaturated soils is relatively small in lateral extent in comparison to the extent of contamination of the saturated soils on the Site. However, the concentrations of organic chemical contaminants in the unsaturated soils is significantly higher than those concentrations in the underlying saturated soils.

The principal source areas of the organic chemical contaminants on the UCC Site are the Old Leach Field, the area surrounding monitoring well B-9 and MW-13, and the perimeter soils surrounding the south side of the former warehouse pad. The most frequently detected organic contaminants in these three principal source areas are: toluene; 1,1,1-trichloroethane (1,1,1-TCA); trichloroethene (TCE); xylene; and tetrachloroethene (PCE). (See attached Figures 7-22 and Table 1).

Additionally, field investigations were also performed during the RI in areas off the Site to determine background conditions and to assess the potential impact of past incinerator operations at the UCC Site. Twenty-four (24) sampling locations were selected within residential yards/woodland areas of South Hope, Maine, and in areas several miles away (both north and south) from the UCC Site (see attached Figure 5). These locations were selected in two ways: (i) randomly, and (ii) based upon best-engineering judgement which incorporated computer modelling of the incinerator stack emissions to simulate where fallout of these emissions may have been deposited onto the ground. Significant variability in sample results for polycyclic aromatic hydrocarbons (PAHs), lead and dioxin made it very difficult to determine precisely whether the source of these contaminants was from past operations at the UCC Site or not. Generally, metals were detected at concentrations which were within the typical State of Maine background levels, and total PAHs were detected at low parts per million (ppm) levels in several off-site locations, primarily residential yards. However, at one location, lead levels exceeded the typical background levels for lead. At another off-site location (the woodland area north of the Site), two surface soil samples were taken. In one of these samples, one dioxin-isomer (out of the eighteen such isomers analyzed for in each of these samples) was tentatively identified at a low parts per billion (ppb) level.

B. Groundwater

Field investigations were conducted during the RI to characterize the quality and movement of groundwater beneath the Site and in surrounding areas. The following is a summary of the results of these groundwater investigations.

- Groundwater in the shallow (till zone) aquifer flows beneath the Site in an easterly direction (under normal, non-pumping conditions at the Site) towards Quiggle Brook (see attached Figure 23).

- Quiggle Brook acts as a groundwater discharge point for the contaminated groundwater flowing beneath the Site (under non-pumping conditions at the Site).

- Concentrations of several volatile organic chemical (VOC) contaminants were detected in the till and shallow bedrock monitoring wells located on-site; specifically, between the eastern fence and Quiggle Brook (see attached Figures 24-29).

- Past operations of two on-site, deep bedrock water supply wells has drawn VOCs from the shallow bedrock into the deeper bedrock.

- Elevated concentrations of VOCs in groundwater are related to the elevated VOC concentrations found primarily in the soils near the Still Building located on the Site.

- The VOCs most frequently detected in the groundwater included (in decreasing order of frequency) 1,1-dichloroethane (1,1-DCA), trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), and 1,1,1-trichloroethane (1,1,1-TCA) (see attached Table 2).

- The existing data are insufficient to confirm or deny the presence or absence of non-aqueous phase liquids (NAPLs) within the subsurface at the Site.

Additionally, sampling was conducted during the RI at numerous residential wells in the area of the UCC Site. The results from these data indicate that the volatile organic chemical impacts identified in one deep bedrock residential well, located immediately north of the Site, can be associated with the Site contamination. These data confirm the presence of contamination identified during several historical sampling rounds from this same residential well. However, chemical data from this bedrock well indicates that no Federal or State of Maine drinking water standards were exceeded at the time of sampling.

C. Surface Waters and Sediments

Analysis of the possible extent of site-related contamination of surface waters on the Site and off the UCC property was also performed during the RI. These investigations focused on the surface waters and sediments within several bodies of water, including:

- Quiggle Brook;
- Fish Pond;
- Crawford Pond;
- The wetland area located in the northwest corner of the property; and
- The wetland area and associated drainage ways located behind the southern-most portion of the fence surrounding the facilities on the Site.

Additionally, analytical results of surface water and sediment samples obtained prior to the RI from Fish Pond and Grassy Pond were also reviewed. These areas are shown on Figure 1 attached hereto.

Surface water samples were collected from five locations within Quiggle Brook (along the eastern property boundary, between Route 17 and the old mill dam) in 1987 and 1988. These samples indicated that the detected concentrations of VOCs (primarily 1,2-dichloroethene, 1,1,1-trichloroethane and 1,1-dichloroethane) were less than those found in similar surface water samples obtained from the same area in 1981 (when the UCC was operational). In addition, these VOCs were not detected consistently in surface water samples obtained from Quiggle Brook during the RI; most likely due to the influence of seasonal variations in the volume of water flowing within the brook.

Sediment samples obtained from this same area of Quiggle Brook during the RI showed variable concentrations of heavy metals. Lead was the predominant contaminant detected within Quiggle Brook sediment samples, but at concentrations within the typical range for State of Maine background levels of lead. However, one sediment sample taken during the summer of 1988 contained lead at 156 parts per million (ppm), which is approximately three to five times background levels. A second sediment sample from this same location during the fall of 1988 indicated lead concentrations within typical background concentrations at 14.1 ppm. PAHs were detected at low concentrations in the sediment samples taken from Quiggle Brook, but were not considered to be at concentrations which would be harmful to public health or the environment and were not detected with any significant degree of frequency in soils on the Site. At a similar, "control" brook (an unnamed tributary to Seven Tree Pond) located approximately four (4) miles west of the Site along State Route 17, sediment samples were taken and analyzed for PAHs (see attached Figure 30). No PAHs were detected in these samples, which suggests that the influence of Route 17 as a potential source of PAHs in Quiggle Brook is unlikely.

Two surface water and sediment samples taken during the RI from Fish Pond (i.e. just downstream from the Hobbs Pond and Fish Pond interconnected waterway/dam, and just upstream of the Fish Pond dam near State Route 17), revealed no detectable concentrations of organic chemical constituents. Inorganic chemicals, including heavy metals, were detected in both of these sediment samples but the concentrations were well within typical State of Maine background levels found for these heavy metals in soils.

Analysis of a surface water sample collected from Crawford Pond indicated the presence of a very low concentration of methylene chloride in the wetland area surrounding the inlet to the pond, which is also the outlet of Quiggle Brook as it flows into Crawford Pond. This low concentration of methylene chloride is thought to have resulted from laboratory contamination during sample preparation. No other chemicals were detected in the surface waters of Crawford Pond.

Sediment samples taken in the wetland area along State Route 17 in the northwest corner of the Site showed highly variable concentrations of heavy metals such as lead, chromium and zinc. Analysis of surface water samples obtained from the wetland area south of the southern-most portion of the on-site fence did show the presence of VOCs (specifically, 1,1,1-trichloroethane, 1,1-dichloroethane, trichloroethene, 1,2-dichloroethene, and tetrachloroethene), but only in the sample taken closest to the southern-most portion of the fence.

Finally, surface water and sediment samples were taken in Grassy Pond and Fish Pond in July 1987 by the Camden and Rockland Water Company for analyses of PCBs, semi-volatile organics, VOCs, and dioxins. None of these chemicals were detected in any of the samples obtained from either pond.

D. Facilities

Samples were obtained from within the buildings and other facilities/equipment remaining at the UCC Site during the RI. Samples consisted of liquid, sludge, ash, dust, fiberglass, floor sweepings, wood shavings, and floor scrapings from the incinerator, floor drainage sumps, tanks, and other structures and equipment remaining from past UCC operations. Analytical results of these samples indicated that concentrations of organic and/or inorganic chemicals exist in practically all of these facilities and equipment. Most notably, dioxin and furan contamination was confirmed twice in the ash samples obtained from the secondary scrubber at 2,3,7,8-TCDD toxicity equivalent values of 4.5 to 12.96 ppb and, to a lesser extent, within several other components of the incinerator equipment (2,3,7,8-TCDD toxicity equivalent values of 0.0 to 0.8 ppb). Asbestos was found within the Still Building, and significant heavy metals contamination (exceeding certain characteristic hazardous waste limits) was identified within the various sump and incinerator ash/sludge samples collected.

A more complete discussion of the Site characteristics can be found in the Final Draft Remedial Investigation report within Section 3.0, pages 32 through 58.

VI. SUMMARY OF SITE RISKS

A Baseline Risk Assessment (Baseline RA) was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site. The public health risk assessment followed a four step process: 1) contaminant identification, which identified those hazardous substances which, given the specifics of the Site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and 4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the Site, including carcinogenic and non-carcinogenic risks. Several EPA guidance documents were used in the preparation of the Baseline RA including, but not limited to : (i) Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989; and (ii) Supplemental Risk Assessment Guidance for the Superfund Program, EPA Region I, Draft Final, EPA 901/5-89-001, June 1989.

The results of the public health risk assessment performed for the UCC Site are discussed below followed by the conclusions of the environmental assessment.

A. Public Health Risk Assessment

Of the more than seventy (70) organic and inorganic chemical constituents detected in the groundwater, soils, surface waters, sediments, and facilities on and off the UCC Site, as shown in Tables 1 through 5 attached to this Record of Decision (ROD), twenty-three (23) contaminants of concern were selected for evaluation in the Baseline RA. Table 6, also attached, lists these 23 contaminants of concern. These contaminants of concern are considered to constitute a representative subset of the more than 70 contaminants identified at the Site during the Remedial Investigation. These 23 contaminants of concern were selected to represent potential Site-related hazards based on toxicity, concentration, frequency of detection, mobility and persistence in the environment. A summary of the health effects of each of these 23 contaminants of concern can be found in Section 12.2.3, pages 182 through 192, of the Final Draft Remedial Investigation (RI) report, while detailed toxicity profiles of each contaminant of concern is provided in Appendix S of the Final Draft RI report.

Potential human health effects associated with exposure to these 23 contaminants of concern were estimated quantitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present (current) uses, potential future uses (specifically, residential use), and location of the Site. Table 7 of this ROD identifies the exposure pathways considered. Table 8 provides the exposure assumptions used in the Baseline RA. A more thorough description of the exposure pathways can be found in Section 12.4, pages 201 through 221, of the Final Draft RI report.

For each exposure pathway developed and evaluated for each impacted medium at the UCC Site, carcinogenic and non-carcinogenic health risks were estimated for an average and a reasonable maximum exposure scenario which corresponded to exposures to the average (i.e., geometric mean) and the maximum concentration detected in that particular medium at the UCC Site.

Excess lifetime carcinogenic (cancer) risks were determined for each exposure pathway by multiplying the exposure level with the chemical-specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" estimate of the risk posed by potentially carcinogenic compounds. That is, the true risk is very unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} for 1/1,000,000), and indicate (using this example) that an individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of Site-related exposure as defined for the given compound at the stated concentration. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard index was also calculated for each exposure pathway as EPA's measure of the potential for non-carcinogenic health effects. The hazard index is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard index is often expressed as a single value (e.g., 0.3) which indicates the ratio of the stated exposure as compared to the reference dose value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard index is only considered additive for compounds that have the same or similar toxic endpoints (for example: the hazard index for a compound known to produce liver damage should not be added to that of a second compound whose toxic endpoint is kidney damage).

The attached Tables 9 and 10 depict the present (current) risks and the potential future (residential use) risk estimates, respectively, for each of the exposure pathways presented in Table 7. These tables also present both the carcinogenic and non-carcinogenic risks estimated for each exposure pathway and corresponding average and reasonable maximum exposure scenarios, as well as an indication of the contaminant(s) which contribute the most to the estimated risk for that particular exposure pathway. The reader should refer to tables 25 through 62 of Appendix X of the Final Draft RI report, for additional specifics on the individual risk estimates for the contaminants of concern and exposure pathways evaluated for the UCC Site.

Based upon the detailed information provided in the Section 12.0, The Baseline Risk Assessment (RA) and corresponding appendices, of the Final Draft RI report, the following conclusions were developed:

o The 23 contaminants of concern selected for evaluation in the Baseline RA represent the majority of the carcinogenic and non-carcinogenic hazards (risks) posed by the UCC Site.

Current Risks:

o Potential incremental carcinogenic risks, over a lifetime (70 years) of exposure, are limited under current Site conditions primarily because of the existing fence which surrounds the major source areas of contamination on the Site.[1] The estimated risks under current site conditions range from 1×10^{-5} (from absorption of incinerator residues containing dioxin) to 2×10^{-11} (from ingestion of other facilities residues). These current, potential incremental

[1] If the fence did not prevent access to the Site, current risks from exposure to on-site soils would likely be equivalent to or less than the risk quantified under future site conditions, which are calculated with the assumption that the Site will be used for residences.

cancer risks do not exceed the lower limit of EPA's acceptable risk range of 10^{-4} to 10^{-6}, but, when compared to the State of Maine's policy guidance for cancer risks greater than 10^{-5}, may indicate a basis for health concern. See attached Table 9.

- Non-carcinogenic or other adverse health risks (hazards) are not expected to result from exposures assumed under current Site conditions because the hazard indices calculated did not exceed 1.0. See attached Table 9.[2]

Future Risks:

- Under future Site conditions, an increased risk of cancer over a lifetime of exposure may be associated with the Site, if the UCC Site is not cleaned up. This estimated excess lifetime cancer risk is principally from the ingestion (drinking) of the contaminated Site groundwater. The estimated carcinogenic risk from the ingestion of on-site groundwater ranges from 1×10^{-1} (worst case scenario) to 6×10^{-4} (average case scenario). These estimates exceeds EPA's lower risk range limit of 10^{-4} and the State of Maine's risk policy guidance of 10^{-5}. The major contaminants of concern which are contributing most to this carcinogenic risk are 1,1-dichloroethene, 1,1-dichloroethane and trichloroethene (see attached Table 10). The future risk associated with exposures to on-site soils ranges from 6×10^{-5} to 4×10^{-7}, and does not exceed the lower limit of EPA's acceptable risk range of 10^{-4} to 10^{-6}.

- If ingestion of the contaminated Site groundwater were to occur in the future over a lifetime, non-carcinogenic effects could be observed in individuals ingesting this groundwater. The hazard index is estimated at 26 (worst case scenario). The major contaminants of concern which are contributing most to this potential hazard are methylene chloride and 1,1-dichloroethene (see attached Table 10).

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[2] As indicated above for carcinogenic risks, if the fence did not prevent access to the Site, current non-carcinogenic risks from exposure to on-site soils would likely be equivalent to or less than the risk quantified under future site conditions.

B. Environmental Assessment

An environmental assessment was also conducted for the UCC Site, which incorporated the results of the wetlands assessment and RI field sampling activities performed. The results of the wetlands assessment can be found in Appendix I of the Final Draft RI report, while Section 12.7 of the Final Draft RI report provides a narrative discussion of the environmental assessment.

Overall, this environmental assessment concluded that, while significant hazards do not exist, potential impacts could occur to the wildlife population at the Site if they came in direct contact with the contaminated soils, sludges, and facilities. Additionally, the environmental assessment concluded that biota present in the intermittently wet area (wetland) in the northwest corner of the Site (see attached Figure 31) may be adversely affected by the presence of metals in the sediments of this area. However, based on the conclusions provided in the wetlands assessment, this isolated wetland area primarily serves as a detention area for stormwater runoff from Route 17 and its functional value is considered low in comparison to the wetlands associated with Quiggle Brook. Finally, this assessment concluded that the organic and inorganic contaminants observed in Quiggle Brook would not adversely affect the benthic organisms in this brook.

C. Conclusions

In summary, the public health and environmental assessments showed that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all Federal and more stringent State environmental standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed for the UCC Site to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed for the UCC Site to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment. These response objectives are :

1. On-Site Soil Remedial Action Objective

   - Prevent further leaching and migration into the groundwater of contaminants in the soils on the Site, by removal and treatment of contaminants above specific concentrations throughout the Site.

2. Groundwater Remedial Action Objectives

   - Provide rapid restoration of the contaminated groundwater throughout the Site, to concentrations that will protect current and future users, as well as natural resources (i.e., wildlife) that come into contact with the contaminants contained within the groundwater.

- Protect off-site groundwater and surface waters (particularly Quiggle Brook) by preventing further migration of the contaminated on-site groundwater.

3. Facilities Remedial Action Objectives

   - Prevent ingestion or absorption of contaminants (particularly dioxins) contained within the incinerator equipment remaining on the Site.

   - Prevent inhalation of friable asbestos from the Still Building.

   - Remove all existing structures located on the Site to allow for the cleanup of contaminated soils found throughout the Site.

   - Remove all other contaminated materials from the facilities so that the Site will be suitable for all potential future uses.

4. Off-Site Soil Remedial Action Objective

   - Further evaluate and, if necessary, minimize and/or mitigate any potential risks to public health and the environment from potential soil impacts due to contaminants which were previously emitted from the UCC Site incinerator.

B. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of remedial alternatives were developed and evaluated for the UCC Site.

With respect to source control remedial actions which focus on the contaminated on-site soils, the RI/FS developed a range of remedial alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances was a principal element. This range included alternatives that remove or destroy hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long-term management controls. This range also included alternatives that treat the principal threats posed by the Site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative.

With respect to groundwater remedial actions, the RI/FS developed a limited number of remedial alternatives that attain site-specific remediation levels within different timeframes using different technologies; and a no action alternative.

With respect to the on-site facilities and off-site soils remedial actions, the RI/FS developed only a limited number of remedial alternatives which were consistent with the source control and management of migration response objectives; as well as no action alternatives.

As discussed in Section 4.0 of the Final Draft Feasibility Study (FS) report, remedial technologies were identified, assessed and screened based on the following factors: implementability, effectiveness, and cost. These remedial technologies were combined into their appropriate source control (SC), management of migration (MM), facilities management (F), and off-site soils (OS) remedial alternatives. Section 5.0 of the Final Draft Feasibility Study report presents the remedial alternatives developed by combining the remaining technologies identified in the previous screening process into, at a minimum, the categories identified in Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial alternatives for further detailed analysis while preserving a range of options. Each remedial alternative was then evaluated and screened later in Section 5.0 of the Final Draft Feasibility Study report.

In summary, of the seven (7) source control, six (6) management of migration, five (5) facilities management and two (2) off-site soils remedial alternatives screened in Section 5.0, all but one (1) source control remedial alternative was retained for detailed analysis. Table 11, attached to this ROD, identifies the source control, management of migration, facilities management, and off-site soils remedial alternatives that were retained through these various screening processes. This table also identifies a source control remedial alternative (SC-4) which was eliminated from further consideration, because of its disproportionate cost in relation to its effectiveness and implementability, as compared to other source control alternatives involving treatment of the contaminated on-site soils.

VIII. DESCRIPTION OF ALTERNATIVES

This Section of the ROD provides a narrative summary of each remedial alternative evaluated in detail in the Final Draft FS report. A detailed tabular assessment of each alternative can be found in tables 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 74, 77, 80, 82, and 84 of the Final Draft FS report.

A. Source Control (SC) Alternatives Analyzed

The source control alternatives analyzed in detail for the UCC Site included the No-Action (SC-1); Limited Action (SC-2); Site Capping (SC-3); Soil Excavation and Low-Temperature Thermal Aeration Treatment (SC-5); In-Situ Soil Aeration (SC-6); and Soil Excavation and High-Temperature Thermal Treatment (SC-7) remedial alternatives.

SC-1: No-Action

This source control (SC) alternative would involve no remedial action on any of the contaminated soils found at the Site. This alternative is included in the Feasibility Study's detailed analysis to serve as a basis for comparison with the other SC remedial alternatives considered. A no-action alternative would be selected only if the Site posed little or no risk to public health and the environment.

This alternative includes the monitoring of groundwater and Quiggle Brook. The no-action alternative would entail a review of the Site conditions every five years. For purposes of estimating costs of this alternative in the Final Draft FS, it was assumed that this alternative would be implemented for 30 years.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED TIME OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $0
ESTIMATED TOTAL COST (NET PRESENT WORTH): $78,000

SC-2: Limited Action

The limited action alternative consists of institutional actions that may be taken to reduce the potential for exposure to the contaminated source area soils.

Specifically, this alternative includes annual maintenance of the existing chain link fence and warning signs around the Site; deed restrictions to prevent development and use of the Site and adjacent off-site areas; and five-year reviews of the Site conditions to evaluate the necessity of additional remedial actions.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED TIME OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $5,000
ESTIMATED TOTAL COST (NET PRESENT WORTH): $101,000

SC-3: Site Capping

This source control alternative consists of constructing a multimedia, RCRA-compliant cap over the contaminated on-site soils to limit additional exposures to the soil contaminants which pose a relatively low long-term threat alone but, more importantly, to reduce or eliminate the migration of chemical contaminants from the unsaturated soils into the underlying groundwater system which poses the principal threat at the Site. This alternative was evaluated in detail considering three soil cleanup levels as presented in the Final Draft FS report. More specifically, Case A.1 included capping those contaminated soils greater than 0.1 ppm (covering approximately 39,200 square feet), Case A.2 included capping those contaminated soils exceeding 1.0 ppm (covering approximately 21,200 square feet), and Case A.3 included capping those contaminated soils exceeding 10 ppm (covering approximately 11,800 square feet). To implement this alternative, the facilities covering these contaminated soils would need to be demolished and removed. This alternative would also include the institution of deed restrictions prohibiting Site development.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-2 years
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST:
$260,000 for Case A.3
$458,000 for Case A.2
$812,000 for Case A.1
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$404,000 for Case A.3.
$602,000 for Case A.2.
$956,000 for Case A.1.

SC-5: Soil Excavation and Low-Temperature Thermal Aeration Treatment

This source control remedial alternative involves the excavation of contaminated on-site soils and low-temperature thermal treatment of these soils. The Final Draft FS report considered three soil cleanup levels for implementation of this alternative: Case A.1 (approximately 8,500 cubic yards of in-place soil), Case A.2 (approximately 5,100 cubic yards of in-place soil), and Case A.3 (approximately 2,600 cubic yards of in-place soil). An additional version of the 0.1 ppm soil cleanup level was evaluated in the Final Draft FS report for this remedial alternative, and is referred to as Case B.

[Note that Case B of this SC remedial alternative has been selected as a component of the overall remedy which addresses the contaminated soils on the Site. The Case B option, which involves the excavation and treatment of both unsaturated and saturated contaminated soils (approximately 10,500 cubic yards of in-place soil), is discussed in detail in Section X, "The Selected Remedy" portion of this ROD].

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-1.5 years
ESTIMATED PERIOD OF OPERATION: approximately 6 months
ESTIMATED CAPITAL COST:
$1,579,000 for Case A.3
$2,210,000 for Case A.2
$3,059,000 for Case A.1
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$1,579,000 for Case A.3.
$2,210,000 for Case A.2.
$3,059,000 for Case A.1.

SC-6: In-Situ Soil Aeration

This alternative involves the extraction of contaminants from the unsaturated on-site soils (contaminated soils above the groundwater table) using an in-situ vacuum extraction method. The contaminants in the soils are removed without excavation. The contaminated soils remain "in-situ" or in place while undergoing treatment. Piping is attached to extraction wells and also to a vacuum pump. The vacuum pump draws air from the surrounding contaminated soils into the wells without disturbing the soils. As the air passes over the contaminated soils, VOC contaminants are transferred from the soil to the air. The air is then sent through carbon adsorption columns that remove the contaminants from the air, and the treated air is discharged to the atmosphere. The carbon is then regenerated to remove the contaminants, and then reused in the process for further treatment of the contaminated air. The contaminants removed from the carbon are permanently destroyed. Other components of this option include the conduct of an pilot study on the Site to guide system design, construction, and operation of the in-situ soil aeration/vacuum system; treatment and disposal of condensed moisture extracted by the in-situ aeration system; soil sampling and analysis to evaluate the cleanup of the contaminated soils to the chosen target cleanup levels; annual inspection and maintenance of the existing fence during the time of remediation; and mulching and planting of grass on the Site following remediation. Removal of the facilities would not be necessary under this option. This alternative was also considered for the three contaminated soil cleanup levels (i.e., Case A.1, A.2, and Case A.3) to be included in the cleanup. These cleanup levels are described as part of Alternative SC-3; more complete descriptions are included in the Final Draft FS report.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-2 years
ESTIMATED PERIOD OF OPERATION: approximately 5-15 years
ESTIMATED CAPITAL COST:
$514,000 for Case A.3
$909,000 for Case A.2
$1,123,000 for Case A.1
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$1,980,000 for Case A.3.
$3,009,000 for Case A.2.
$3,946,000 for Case A.1.

SC-7: Soil Excavation and High-Temperature Thermal Treatment

This alternative involves soil excavation with treatment of the excavated soils using a high-temperature (typically 1,300 to 1,400 degrees Fahrenheit) thermal treatment process on the Site, such as a mobile rotary-kiln incinerator. This alternative was evaluated for the three Case A "suboptions" noted above in SC-3, as well as the Case B option. This alternative would require the removal of the existing facilities on the Site in order to access all the contaminated soils requiring excavation. The contaminated soils that would undergo the high-temperature treatment process would be backfilled on the Site into the original excavation area, and/or used for regrading and vegetating the Site. This alternative would also include air monitoring at the perimeter of the Site during all excavation and treatment operations on the Site. An on-site "trial burn" and sampling effort to evaluate and optimize the destruction and removal efficiency of the mobile incineration system would occur under this alternative.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-1.5 years
ESTIMATED PERIOD OF OPERATION: 6 months-1 year
ESTIMATED CAPITAL COST:
$2,542,000-$5,201,000 for Case A.3
$4,108,000-$7,025,000 for Case A.2
$6,256,000-$9,569,000 for Case A.1
$7,531,000-$11,076,000 for Case B
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$2,542,000-$5,201,000 for Case A.3
$4,108,000-$7,025,000 for Case A.2
$6,256,000-$9,569,000 for Case A.1
$7,531,000-$11,076,000 for Case B

B. Management of Migration (MM) Alternatives Analyzed

Management of migration alternatives address contaminants that have migrated from the original source of contamination. At the UCC Site, contaminants have migrated from the contaminated soils (source) which are primarily located within the 2.25-acre fenced area of the Site into the shallow and deeper aquifers underlying the Site.

The Management of Migration alternatives evaluated in detail for the UCC Site included: No-Action (MM-1), Limited Action (MM-2), Groundwater Extraction with On-Site Treatment and Discharge to Quiggle Brook (MM-3), Vacuum-Enhanced Groundwater Extraction with On-Site Treatment and Discharge to Quiggle Brook (MM-4), Groundwater Extraction with On-Site Treatment and Reinjection (MM-5), and Vacuum-Enhanced Groundwater Extraction with On-Site Treatment and Reinjection (MM-6).

MM-1: No-Action

This alternative would consist of implementing a groundwater monitoring program to assess the continuing condition of the Site. During the program, quarterly water samples would be taken and analyzed and the Site would be reviewed every five years to assess the need for additional remedial action. The no-action (monitoring only) groundwater alternative is included for evaluation, as required by CERCLA, as a basis for comparison with the other MM alternatives. For purposes of estimating costs of this alternative in the Final Draft FS, it was assumed that this MM alternative would be implemented for 30 years.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $0
ESTIMATED TOTAL COST (NET PRESENT WORTH): $890,000

MM-2: Limited Action

This limited action alternative, like Alternative MM-1, would involve continued monitoring of the Site groundwater. The monitoring program for this alternative would be the same as that for MM-1. In addition, this alternative would include the implementation of deed restrictions to limit future development and use of the Site groundwater; for example, prevention of the installation of an on-site water supply or reactivation of an existing well. The deed restrictions would reduce the risk posed by exposure to groundwater.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $0
ESTIMATED TOTAL COST (NET PRESENT WORTH): $895,000

MM-3: Groundwater Extraction, On-Site Treatment, and Discharge to Quiggle Brook

This alternative would involve the extraction and treatment of groundwater on-site by pumping the water containing chemical contaminants with concentrations greater than drinking water standards. Several groundwater extraction wells would be used to extract the contaminated groundwater.

The wells would be installed in the till zone and bedrock aquifers, where groundwater contamination was detected during the RI. Extracted groundwater would be treated with a process called ultraviolet (UV) light/oxidation. This alternative might require pretreatment of the groundwater to remove solids or other matter which could affect the UV/oxidation treatment process. The treated groundwater would be discharged to Quiggle Brook and sampled periodically to determine the effectiveness of treatment. Institutional controls such as deed or zoning restrictions would be required to prevent ingestion of groundwater prior to completion of the cleanup.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-2 years
ESTIMATED PERIOD OF OPERATION:approximately 15-30 years
ESTIMATED CAPITAL COST: $1,114,000
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$4,192,000-$5,014,000

MM-4: Vacuum-Enhanced Groundwater Extraction, On-Site Treatment, and Discharge to Quiggle Brook

This management of migration (MM) remedial alternative has been selected as the remedial alternative component of the overall selected remedy for addressing the contaminated groundwater on the Site. This MM alternative is described in detail in Section X, "The Selected Remedy," of this ROD.

MM-5: Groundwater Extraction, On-Site Treatment, and Reinjection

Alternative MM-5 includes extraction of the contaminated groundwater with concentrations exceeding drinking water standards on the Site by pumping, followed by treatment and reinjection of the treated water back into the till zone aquifer on the Site. Similar to the processes described in alternative MM-3, this alternative would involve installation of extraction wells, extraction of contaminated groundwater to ground surface treatment units, and treatment of extracted water by UV/oxidation. Monitoring and evaluation activities would include sampling of monitoring and extraction wells, monitoring water levels, and periodically performing maintenance and redevelopment of the reinjection wells. Institutional controls such as deed or zoning restrictions would be required to prevent ingestion of groundwater prior to completion of the cleanup.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-2 years
ESTIMATED PERIOD OF OPERATION: approximately 15-30 years
ESTIMATED CAPITAL COST: $1,573,000
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$4,806,000-$5,689,000

MM-6: Vacuum-Enhanced Groundwater Extraction, On-Site Treatment, and Reinjection

This alternative involves extraction of contaminated groundwater with concentrations exceeding drinking water standards, by using vacuum-enhanced extraction wells as described in detail in alternative MM-4 (EPA's Selected Remedy). The only difference between this alternative and MM-4 is that under this alternative treated groundwater would be reinjected into the till aquifer located on the Site (as described in MM-5 above) instead of being discharged into Quiggle Brook. Because of this difference, alternative MM-6 requires the installation of several reinjection wells as described in alternative MM-5, and the monitoring and maintenance inherent with these reinjection wells. Institutional controls such as deed or zoning restrictions would be required to prevent ingestion of groundwater prior to completion of the cleanup.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1-2 years
ESTIMATED PERIOD OF OPERATION: approximately 15-30 years
ESTIMATED CAPITAL COST: $1,648,000
ESTIMATED TOTAL COST (NET PRESENT WORTH):
$5,633,000-$7,615,000

C. Facilities (F) Management Alternatives Analyzed

The Facilities (F) management alternatives evaluated in detail in the Final Draft FS report are described below.

F-1: No Action

This "no action" alternative was evaluated as a baseline for the comparison of other facilities management remedial alternatives. As with other no action alternatives presented previously for source control and management of migration, this alternative would involve ongoing monitoring of the groundwater and other environmental media to assess the condition of the Site. Because the cost for these monitoring programs is included in the management of migration (groundwater) alternatives, the only cost incurred for this facilities management alternative would be that for an evaluation of the Site every five years to determine the need for additional remedial action. For purposes of estimating costs of this alternative in the Final Draft FS, it was assumed that this facilities alternative would be implemented for 30 years.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $0
ESTIMATED TOTAL COST (NET PRESENT WORTH): $78,000

F-2: Limited Action

This alternative consists of institutional actions designed to eliminate or reduce the potential for exposure to the contaminated Site facilities. The activities involved in the implementation of this alternative includes the installation of additional access barriers (fences) and lighting, annual maintenance of the existing fences and signs around the Site area, implementation of deed restrictions, and conducting a review of the Site conditions every five years to evaluate the necessity of additional remedial action.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 6 months
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $13,000
ESTIMATED TOTAL COST (NET PRESENT WORTH): $128,000

F-3: Facilities Decontamination Only

This facilities management alternative includes all of the features of Alternative F-2, with the following additional activities:

- Removal of materials from, decontamination of, and encapsulation of sumps in-place; and
- Decontamination of facilities' concrete pads, walls, and incineration components in-place using high-pressure steam cleaning.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1 year
ESTIMATED PERIOD OF OPERATION: approximately 30 years
ESTIMATED CAPITAL COST: $102,000
ESTIMATED TOTAL COST (NET PRESENT WORTH): $217,000

F-4: Facilities Decontamination and Demolition

This facilities (F) management remedial alternative has been selected as the remedial alternative component of the overall selected remedy for addressing the facilities contamination on the Site. This facilities alternative is discussed in detail in Section X of this ROD, as part of EPA's Selected Remedy for the UCC Site.

F-5: Facilities Demolition and Disposal without Decontamination

This alternative consists of demolition (without prior decontamination) of all Site facilities, including the following:

- Still building and associated production facilities
- Church
- Welding shop
- Incinerator complex
- Concrete pads

Activities involved in the demolition of these facilities would include removal of water from the existing sumps for treatment and disposal, removal of the asbestos from the still building, and demolition, excavation, and backfilling of the sumps. After demolition, the debris would be disposed of off-site in a permitted landfill. Unlike Alternative F-4, no decontamination of facilities is included in this alternative prior to the demolition of the facilities.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 1 year
ESTIMATED PERIOD OF OPERATION: approximately 6 months
ESTIMATED CAPITAL COST: $1,813,000
ESTIMATED TOTAL COST (NET PRESENT WORTH): $1,813,000

D. Off-Site (OS) Soils Alternatives Analyzed

The following alternatives where evaluated in detail in the Final Draft FS report to address the remedial action objectives established for the potential off-site soils contamination potentially resulting from past operations at the UCC Site.

OS-1: No Action

This remedial alternative is a "strict" no action alternative where no additional sampling, analysis or evaluation of the potential off-site soils contamination would occur. This alternative is included in the evaluation of alternatives to address the off-site (OS) soils contamination to provide a baseline for comparison with the other OS alternative considered in the Final Draft FS report.

ESTIMATED TIME FOR DESIGN AND CONSTRUCTION: 0 years
ESTIMATED PERIOD OF OPERATION: 0 years
ESTIMATED CAPITAL COST: $0
ESTIMATED TOTAL COST (NET PRESENT WORTH): $0

OS-2: Limited Action

This off-site (OS) soil remedial alternative has been selected as the remedial alternative component of the overall selected remedy for addressing the off-site soils contamination which may potentially be associated with the Site. This OS alternative is discussed in Section X, "The Selected Remedy," of this ROD.

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that, at a minimum, EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the National Contingency Plan articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a Site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These criteria and their definitions are as follows:

Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP.

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all of the ARARs of other Federal and State environmental laws and/or provide grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

Modifying Criteria

The modifying criteria are used on the final evaluation of remedial alternatives generally after EPA has received public comment on the RI/FS and Proposed Plan.

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the publics general response to the alternatives described in the Proposed Plan and RI/FS report.

A detailed tabular assessment of each alternative according to the nine criteria (excluding criteria #2 above regarding Compliance with ARARs) can be found in tables 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 74, 77, 80, 82, and 84 of the Final Draft FS report. The detailed tabular assessment of each alternative specifically with regards to criteria #2 (Compliance with ARARs) can be found in tables 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 76, 79, and 83 of the Final Draft FS report.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted.

The discussions below present the nine criteria and a brief narrative summary of the alternatives, and the strengths and weaknesses according to the detailed and comparative analysis.

A. Source Control (SC) Alternatives

1. Overall Protection of Human Health and the Environment

Source control alternatives SC-1 and SC-2 (no action and limited action, respectively) do not provide adequate protection of human health and the environment, since no remedial action or only institutional controls are incorporated into these two alternatives. These alternatives would not prevent further migration of contaminants from the source area into the groundwater. Institutional controls alone are not sufficient to protect human health and the environment. The SC-1 alternative was included in the Final Draft FS and in this assessment principally to serve as a basis for comparison with the other SC alternatives considered.

Alternatives SC-3, SC-5, SC-6, and SC-7 provide adequate protection of human health and the environment by different mechanisms. More specifically, SC-3 (capping) achieves overall protectiveness by isolating the soil contaminants from potential human and environmental exposures and reducing the continuing migration of soil contaminants into the groundwater. On the other hand, alternatives SC-5 (soil excavation and low-temperature treatment), SC-6 (soil excavation and high-temperature treatment) and SC-7 (in-situ soil treatment) provide overall protection by permanently eliminating, through treatment, the soil contaminants on the Site and, thereby, the principal threats posed by the contaminated groundwater.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Source control alternatives SC-1 and SC-2 will not comply with the ARARs established for the Site primarily because these alternatives will continue to allow soil contaminants to leach into the groundwater, thereby, perpetuating the exceedance of MCLGs and MCLs.

The implementation of SC-5, SC-6 and SC-7 will comply with the chemical-, location-, and action-specific ARARs determined for the Site and these particular remedial alternatives.

3. Long-Term Effectiveness and Permanence

Alternatives SC-1 and SC-2 would not provide any degree of long-term effectiveness or permanence since the soil contaminants, which are the principal sources of groundwater contamination on the Site, would remain in-place without any form of treatment or containment.

Each of the remaining four source control remedial alternatives would afford both long-term effectiveness and permanence, but with varying degrees of certainty and successful long-term results. SC-3 (capping) would rely on the adequacy and reliability of the cap and the institutional controls in order to provide the continued maintenance needed for long-term protection. SC-5, SC-6 and SC-7 provide a greater degree of certainty regarding ultimate success than SC-3, since these three remedial alternatives employ treatment rather than containment of the soil contamination at the Site. Among the three treatment alternatives, attainment of low part per million cleanup levels is more certain with SC-5 and SC-7 than SC-6. As such, the risk to groundwater from residual contamination is probably greater for SC-6 than for SC-5 and SC-7.

4. Reduction of Toxicity, Mobility or Volume Through Treatment

Source control alternatives SC-1, SC-2 and SC-3 do not provide any reduction of the toxicity, mobility or volume of the soil contaminants at the Site since treatment is not employed as a part of these alternatives.

In contrast, SC-5, SC-6 and SC-7 employ treatment which will permanently and significantly reduce the toxicity, mobility and volume of the hazardous substances in the soil at the UCC Site. However, based upon available information, it is less certain that SC-6, in-situ soil aeration, can achieve cleanup levels in the low parts per million range. In addition, the time frame for cleanup using SC-6 is more uncertain. Finally, without extensive excavation or drilling, it is difficult to verify attainment of cleanup levels throughout the soils which have been treated in-situ. Even then, pocket of chemical residues could exist in areas or depths which are not sampled.

5. Short-Term Effectiveness

While alternatives SC-1 and SC-2 would pose the least short-term impacts to the surrounding community and the limited number of workers required to implement them, these alternatives do not provide overall protection or comply with ARARs.

In comparison, alternatives SC-3, SC-5, SC-6 and SC-7 will each result in some degree of short-term impacts to the community, workers and the environment on and surrounding the Site during implementation. The magnitude of such impacts varies primarily among those alternatives requiring excavation (i.e. SC-5 and SC-7), which results in a greater potential for airborne emissions from the Site, and those alternatives which cap (SC-3) or treat in-situ (SC-6) the soil contaminants at the Site. However, the anticipated effectiveness and reliability of mitigative measures to reduce such impacts would offset these potential impacts. Additionally, these short-term impacts, when assessed together with the time period required until overall protection of human health and the environment is achieved, warrants further consideration of SC-5 and SC-7.

6. Implementability

All source control alternatives are considered to be readily implementable. It should be noted that most of these alternatives (excluding SC-1 and SC-2) require that certain facilities (F) alternatives are implemented in concert with these SC alternatives. More specifically, SC-3, SC-5 and SC-7 require that the existing facilities on the Site be demolished to cap or to excavate the soil contaminants which are migrating and contaminating the groundwater at the Site. On the other hand, while demolition is not a prerequisite for implementation of SC-6, the facilities could hinder placement of strategic wells necessary for in-situ aeration.

Additionally, as stated above, with respect to in-situ treatment (SC-6) of the contaminated soils, it is difficult to verify attainment of cleanup levels throughout the soils which have been treated in-situ. SC-6 would thus likely require a more extensive effort to verify the attainment of the low cleanup levels required.

7. Cost

As provided in the attached Table 12 and in Appendix D of the Final Draft FS, the capital, annual operation and maintenance and net present worth costs for all source control alternatives vary depending on the degree of complexity, treatment and effectiveness afforded by a particular alternative. In particular, alternatives SC-5, SC-6 and SC-7, which all incorporate treatment but differ in the mechanics of such treatment, have a range of present worth costs of from approximately $1.5 to $11.1 million (depending on the soil cleanup levels).

8. State Acceptance

Overall, the State of Maine, Department of Environmental Protection (MDEP) is in favor of SC-5. While recognizing that SC-6 is less expensive and would result in less short-term impacts over SC-5, the trade-offs are that source remediation will take longer. Additionally, attainment of the low soil clean-up levels is less likely and verification of attainment in the heterogeneous site soils would be more difficult with SC-6. Therefore, the State of Maine believes that SC-5 will make attainment of groundwater clean-up levels more likely and reduce the time, and thus cost, of the management of migration portion of the remedy.

9. Community Acceptance

In general, the comments received during the public comment period (both orally and in writing) and the discussions held at the public informational/hearings suggested that the community favored (with reservations) the source control remedy identified in the Proposed Plan, but did not offer any other recommendations with regards to the other source control alternatives. Comments received during the public comment period are attached in document entitled "Responsiveness Summary" (Appendix A).

Click here to view the rest of Summary